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Bio-Nanotechnology and COVID-19

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ABSTRACT

Nanotechnology can solve many health problems caused by the coronavirus pandemic. This study will explore in depth how nanotechnology can help in fighting against this pandemic and the ongoing mitigation strategies. Nanomaterials are currently being developed and marketed for COVID-19 storage, detection and treatment. On the other hand, nanotechnology in various fields of science and technology can be of great help in the diagnosis, prevention as well as treatment of COVID-19.

Key words: Nanotechnology, COVID-19, Nanotherapy, Diagnosis, Health

INTRODUCTION

Outbreak of the global issue pertaining to new deadly virus called the new Coronavirus 2019 (2019-nCoV), the World Health Organization (WHO) announced Coronavirus (COVID-19) an epidemic and a state of emergency in 2019. COVID-19 is said to have come from Wuhan, China. In order to maintain control on disease as well as for the prevention of the same, various centers are available in three different countries around the world, including the United States, Germany, and Vietnam [1].

However, WHO rejected clear evidence prior to January 14, 2020, referring to a report that should also be discussed and examined by the Chinese authorities that the individual's personal transmission occurs before January 14, 2020. To date, the coronavirus has infected more than a million people worldwide and has caused more than 55,000 victims. In most countries, a curfew and a mandatory quarantine have been officially reported, hoping to prevent the virus from spreading too quickly [2].

In general, coronaviruses are a different family of helically coiled RNA viruses that contains the largest 26 to 32 kilobase genomes known among all RNA viruses. They are found in a wide variety of hosts that can infect species such as mammals and birds. Four major types of coronaviruses are α-coronaviruses, β-coronaviruses, ϒ-coronaviruses and ∂-coronaviruses, where α-coronaviruses and β-coronaviruses infect mammals; ϒ-coronaviruses infect birds and

∂-coronaviruses can infect both birds and mammals [3].

The new human zoonotic coronavirus was first reported by the Chinese Centers for Disease Control and Prevention (CCDC) 2 on January 9, 2020. The coronavirus genome is encapsulated in a helical protein coating known as capsid and lipid molecules. In particular, the viral envelope contains three structural proteins, and the viral mechanism contains membrane proteins, including nucleocapsid and envelope proteins [4].

Spike protein in coronaviruses forms corona-like structures, which emerge from the surface of the virus used to penetrate host cells. The S1 and S2 are involved in it, where S1 binds to the receptor and S2 for fusion with membrane of host cells. S protein is common target of neutralization by antibodies and other vaccines. Nucleocapsid protein is virtually unchanged and used as a marker in diagnostic tests [5].

Diagnostic Aspect

Coronavirus Respiratory Disease 2019 (COVID-19) clinical trial includes the use of reverse transcription polymerase chain reaction (rRT-PCR) performed in samples collected by the respiratory system by various methods such as swab from nasopharyngeal routes. The reports are displayed for several hours to 2 days. COVID-19 and SARS-CoV-2-based diagnostic kits were developed by BGI team and the U.S. Centers for Disease Control and Prevention. Coronavirus RNA is converted to DNA, and the multiplier is tracked millions of times until the analyzer, called the PCR tool, finds the corresponding copy of the duplicated DNA. A person is positive for the virus if the virus genetic code is recognized. Most of the newly created sets available are capable of finding different genes within the coronavirus and come with three analyzes. If mutation is there, the complex will be able to find and recognize the new generation formed. For one or two tested positive responses, the results should be written as a catalog of viral genomes to prevent the spread of new viruses [6].

Available complexes can find target proteins called human RNA polymerase protein (ORF1 gene), nucleocapsid protein (N gene), and envelope protein (E gene). There is also a set that corresponds to the other protein (gene S) on the coronavirus. In addition to the complexes, there are currently other detection platforms. Nano sensors will replace heat-sensitive weapons used to detect and measure high heat in

people suspected of infecting airports and borders [7].

Role of Nanotechnology in treatment of COVID-19

Till now, no clear cure or vaccine has been proposed for the treatment of COVID-19. The exception is the drug traditionally used to improve the immune system i.e. chloroquine. However, Nano pharmaceuticals, can not only make a major contribution to medicine and pharmaceuticals, but also emerge to prevent the lethal outbreak of COVID-19 worldwide [8].

Nanoparticles are expected to alter size and enhanced properties as a result of a significant increase in surface area between volume and volume. The structure of the coronavirus reveals a resemblance to nanoparticles. Influence or binding of small nanoscale particles, such as viruses, to the highest levels of proteins is primarily due to the fact that infrared electromagnetic radiation causes the structure of the virus to be disrupted [9].

Theranostics is a new drug that includes the detection and neutralization of viruses with Nano drugs and Nano pharmaceuticals with an emphasis on diagnosis and treatment. As a result, there are reports of the application of nanoparticles to combat the microorganisms that cause influenza and tuberculosis. Due to their potential for surface modification and functionalization, nanoparticles are able to trap pathogens and viruses and numerous reports have been reported [10]. The nanoparticles can also be modified or functionalized to dissolve the viral lipid membrane, bind proteins at the S1 peak, and envelope and encapsulate nucleocapsids and RNA. Nanoparticles can be processed to attack certain pathogens. Given their size, the modified nanoparticles act to detect viruses without causing problems to the body or interfering with other functions that are specifically involved in the human immune system. If COVID-19 lasts longer than this year, we need to tailor the current research strategies to address the major stresses on our healthcare that COVID-19 has created. The Society of Nanotechnology can make an important contribution to the war against COVID-19. Nanomaterials are used in care diagnostics, and vaccine development [11].

People infected with SARS-CoV-2 may be carrier of the same broad spectrum of symptoms as other respiratory infections or silence. COVID-19 co-proliferation is a major concern. It is important to conduct economically viable and rapid diagnostic tests for physicians in local hospitals. With

these diagnoses, frontline employees can simply scan the patient and prevent virus spread. Diagnosis is important in determining the spread of infection. With rapid diagnosis and mass surveillance, public health workers can monitor the spread of the virus, actively identify areas of infection, anticipate an increase in capacity, and direct the necessary resources where necessary [12].

CONCLUSION

The success of this system depends on the open cooperation and communication between the federal government and major health institutions. The WHO argued that broader evidence is needed to prevent the epidemic. Patients may need treatment after identified with COVID-19. These treatments block the viral replication. The main research of Nano biological effects can be adapted to understand how SARS-CoV-2 affects cells. Vaccines are the key to preventing disease by boosting their immunity against pathogens. The life we know before this epidemic will change forever. Our society is capable of accelerating the translation of development and using nanotechnology as a leading tool.

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